NISTTech

Mounting System for Optical Frequency Reference Cavities

Exceptional frequency stability in optical lasers

Description

This technique inexpensively achieves laser optical frequency stability by placing a very stable reference cavity vertically with respect to the optical cavity. The vertical symmetry of the design reduces distortions to obtain desirable ultra-narrow laser linewidth. This technique mounts the reference cavity vertically at a single central plane without the distortions caused by mounting clamps.

The cavity is mounted vertically at its horizontal geometrical midplane using a collar of an extremely low thermal expansion coefficient material surrounding and uniformly supporting the spacer cylinder of the cavity. The spacer is also formed of the same or similar material. Once the collar has been properly located, it is cemented in place so that the spacer cylinder is uniformly supported and not squeezed by clamps or the collar. Both the collar and spacer can be fabricated as one uniform unit. The cavity may be supported from above by spring-mounted wires or below by stabilized rods.

Applications

- **Optical lasers**
  Low cost solution providing exceptional frequency stability.

Advantages

- **Inexpensive and simple to implement**
- **Permits vertical mounting of reference cavities to reduce distortions**

Abstract

A technique for reducing the vibration sensitivity of laser-stabilizing optical reference cavities is based upon an improved design and mounting method for the 5 cavity, wherein the cavity is mounted vertically. It is suspended at one plane, around the spacer cylinder, equidistant from the mirror ends of the cavity. The suspension element is a collar of an extremely low thermal expansion coefficient material, which surrounds the spacer cylinder and contacts it uniformly. Once the collar has been properly located, it is cemented in place so that the spacer cylinder 10 is uniformly supported and does not have to be squeezed at all. The collar also includes a number of cavities partially bored into its lower flat surface, around the axial bore. These cavities are support points, into which mounting base pins will be inserted. Hence the collar is supported at a minimum of three points.

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References

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Status of Availability

This invention is available for licensing exclusively or non-exclusively in any field of use.

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